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NEW ZEALAND MARINE DEPARTMENT
FISHERIES TECHNICAL REPORT
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Occurrence and distribution of the dredge oyster (ostrea sinuata) in Tasman and Golden Bays

B. R. Tunbridge

WELLINGTON, NEW ZEALAND 1962

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Introduction:

During October 1961, the oyster beds in Golden and Tasman Bays were investigated. Oysters have been taken from both bays for many years but this survey was the first to examine in some detail their occurrence and distribution.

The Marine Department research vessel "Ikatere" was used for this investigation.

The species of oyster found in Tasman Bay is *Ostrea sinuata*.

Method of Working:

Fixing of Position:

In order to ascertain the location of any oyster beds present, it was first necessary to systematically sample the bottom of Golden and Tasman Bays. It was felt that it was more important to know exactly where each sample was taken from, rather than to try to space the dredge shots out to an even pattern.

Prominant landmarks were therefore taken as markers and a compass bearing obtained from them. These bearings were generally at right angles to the coastline. A number of dredge shots were made along each bearing, moving progressively out into deeper water. The position of each shot was checked by a depth sounding, a cross bearing on prominant landmarks and a check on the distance steamed from the previous position.

Sampling:

In order to obtain correlation between these results and those obtained down in Foveaux Strait a similar type of dredge was towed for a comparable length of time.

The first phase of the survey was a quick examination of the whole area to try to determine the general area of oyster beds prior to a more detailed examination of those which appeared to be most profitable.

The dredge used was English designed and built, and had already been used successfully in other parts of New Zealand by the Marine Department. It had a mouth opening of 3 feet by 9 inches and its total length was about 4½ feet, of which, about 2 feet, was taken up by the wire netting bag.

It was towed at an engine speed of 350 to 400 RPM (Gardener 150 HP) boat length 63 feet, giving a speed of approximately 3 to 4 mph. The length of warp varied from twice the depth in the initial survey to three times in the more intensive survey. The towing time remained constant throughout the whole survey at 5 minutes actually on the bottom for each shot.

The dredge was lowered and raised from the aft gallows and specimens sorted and measured on the aft deck. All live oysters were measured and the numbers of dead oysters, mussels and scallops recorded for each haul.

After the initial survey (resulting in the finding of 4 oyster beds) was completed, a more detailed examination was carried out. In the most promising area, samples were taken at 1 mile intervals over an area of approximately 70 square miles.

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GOLDEN BAY

Separation Point to Farewell Spit

Sampling:

Nine runs were made and a total of 46 separate samples were taken. The depth of water over the area surveyed ranged from 3 to 18 fathoms and the water temperature varied from 12° to 15° Centigrade.

The plotting of exact positions was difficult at times, owing to strong local magnetic attraction, variations between depths recorded on the sounder and chart, and low lying mist and cloud sometimes preventing accurate cross bearings. After the initial survey in Golden Bay resulted in the finding of a small bed of oysters off Onekaka, several more shots were made to find the extent of this area.

Results:

Map 1 shows the position of each shot with the bearing of each run of shots.

Map 2 shows the number of live oysters taken at each position and the general position and outline of the small oyster bed located near Onekaka.

Map 3 shows the bottom structure and associated fauna. The number of dead oysters taken on the oyster bed are also included.

Graph 1 is a Length Frequency diagram of all live oysters taken from Golden Bay.

Discussion of Results:

Structure:

The bottom of Golden Bay is smooth and level consisting of fresh black and blue mud. A few pieces of light coral were taken in the vicinity of Separation Point. Between Collingwood and Onekaka, short red and green seaweed was found growing inside the 5 fathom mark. Near Tarokohe and Wainui Inlet the sand extends out 1 to 2 miles. Great quantities of rubbish was dredged up on the edge of the sandbank inside Farewell Spit. The rubbish consisted of brittle stars, small sea eggs, seaweed, dead bivalves including *Dosinia*, *Glycymeris* and *Gari*, dead oyster and scallop shells. A few live oysters and scallops were also found.

It is likely that the rubbish is deposited here by water currents sweeping around the edge of the spit. It was noticed that the bottom in the centre of Golden Bay was very clean. Water temperature ranged from 12.0° C in the evening to 15.0° C in the late afternoon.

Oysters:

The oysters in Golden Bay have a much lighter and thinner shell than those from Tasman Bay. The shells are generally ornate and clean. The size range (total length) is similar to Tasman Bay, except for one difference, in Golden Bay there is a paucity of juvenile oysters under 2.0 inches.

A total of 171 live and 1664 dead oysters was obtained over the whole area from 45 5-minute tows; of this quantity 112 live oysters were taken in 9 5-minute tows in one area (marked on map 2). This patch of oysters extended from Collingwood to Takaka in from 5 to 10 fathoms. Only 8 of the 112 live oysters taken were under the minimum size limit of 2⅛ inches. Thus 92.8% of the catch was of a marketable size. However as stated previously the Golden Bay oysters are very light shelled with little depth, so that anything under 3.0 inches in length is hardly economic because of the very small amount of flesh obtained.

Under these circumstances 27 out of the 112 were untakeable giving 76% of the catch being of a marketable size.

Apart from the odd oyster here and there, the only other concentration was on the inside of Farewell Spit.

In 5 drags in water of 8 to 14 fathoms depth, 35 live oysters were taken, of which only 34.0% were over 3.0 inches. These oysters were mixed in with the rubbish and this fact plus the small number of oysters would exclude this area on a commercial basis.

The Length Frequency Graph No. 1 shows two peaks, one at 2.3 inches and another at 3.5 inches. The small number of specimens make any conclusion doubtful. However, notice the paucity of juvenile oysters under 1.5 in. This could be due to a sampling fault but this is unlikely when compared with results from Tasman Bay; it probably indicates a very poor spatfall last year.

Scallops:

The only ones taken were 4 5.0 in. specimens at Puponga and 2 from the inside of Farewell Spit.

Mussels:

The only occurrence of mussels was at Tata Island just west of Wainui Inlet, where 6 were taken in one drag and 5 miles out from Collingwood where 3 were taken in another drag.

Summary - Golden Bay

A small patch of oysters occupying an area of approximately 10 square miles, with an average catch of 9.3 marketable oysters per 5 minute drag exists in Golden Bay. 76% of the total catch was marketable although the oysters were somewhat lighter than those in Tasman Bay.

Large quantities of dead shell indicate the existence of oysters in the past.

There is a lack of juvenile oysters and it appears that there was a poor spatfall last year.

Conclusion:

At present they are of little commercial use, but the presence of living oysters shows that conditions for growth and survival are satisfactory and the area may be suitable to be worked over and improved. However, at the present time introduction of cultural bed methods with a view to improving the growth and fattening of adult oysters and the ensuring an adequate supply of young oysters would hardly be an economic proposition.

TASMAN BAY

Separation Point to Adele Island:

This section of coast, approximately 13 miles long, was examined at several places. No living oysters were found and only 36 dead shells. Patches of scallops were found south of Tonga Island and also north of Adele Island.

Map 4 shows the position of each dredge shot, while Map 5 shows the distribution of scallops off Tonga Island.

Southern Tasman Bay:

Introduction:

After an initial random sampling had shown the general position of oysters, a more detailed survey was carried out. The Southern half of Tasman Bay was surveyed at 1 mile intervals and east of Pepins Island to Croixelles Harbour and north of Motueka to Adele Island at 2 mile intervals. The depth of water worked ranged from 3 to 23 fathoms.

Map 6 shows the position of each dredge shot.

Bottom Structure:

The whole of the bay has a uniform mud bottom. At the south end opposite Rabbit Island, sand occurs and along the coast from Mapua to Port Motueka, patches of red seaweed and boulders were found.

Some rough bottom was located close inshore at the North end of the Boulder Bank. Six miles out from Adele Island, small pieces of coral were recovered in the dredge. The water temperature varied from 13°C in the evening to 18.5°C in the late afternoon.

At the southern end of Tasman Bay, the water inside the 4 fathom mark, was cloudy with suspended sediment. No oysters were taken here.

Associated Fauna:

Map 10 shows the occurrence of fauna other than oysters.

Scallops:

Although scallops are wide spread over the whole of Tasman Bay, the greatest concentration is in the centre of the Bay, the scallops occupying approximately the same area as the oysters. See Map 11. The number of scallops taken in each drag is recorded on Map 10.

Small patches of juvenile scallops were found west of Pepins Island and north of Whangamoa Head. At Pepins Island one 5 minute drag resulted in a catch of 280 small scallops. Another patch of scallops of a marketable size was found South of Adele Island. Three tows took a total of 55 shellfish.

Mussels:

Only 1 mussel bed, extending over an area of 16 to 20 miles was located, between the 5 to 15 fathom mark and extending out 5 to 6 miles from the north end of the Boulder Bank.

It overlaps onto the southern edge of the oyster bed by about a mile. Nineteen 5 minute drags gave a total of 825 mussels, all these of a commercial size of about 6 to 8 in. in length. The greatest number taken in any one drag was 240.

At the time of the survey the mussels were in very good prespawning condition. Crew members of the "Ikatere" said that they favourably compared with the Auckland mussels. Local fishermen, however, stated that they are in poor condition for much of the year.

Other Fauna:

Very few starfish were taken in Southern Tasman Bay. However, a large patch of brittle stars *Amphiura rosea* was found approximately 5½ miles north of Pepins Island, in 18-20 fathoms. Further patches of brittle stars and occasional specimens of the small green star-fish and the large spiny starfish *Coscinasterias* were taken in the area from Croixelles Harbour to Whangamoa Head.

Three boring gasteropods, *Poirieria zelandica* - spiny murex, *Alcithoe arabica*, and *Struthiolaria*, occurred all over the Bay but were never taken in quantity. This could have been due to the large mesh size of the bag.

The most common bivalves taken were *Glycymeris* and *Dosinia*.

The bottom east of Whangamoa Head is characterized by the abundance of dead oyster and scallop shells. Here very few living oysters were found.

A typical dredge shot in this area would give a quantity of mud, a few dead oyster shells (valves separate indicating that they had been dead for some time), dead scallops, a few *Dosinia* and the occasional *Struthiolaria*, usually dead, and *Alcithoe* (usually living). Many of the dead *Struthiolaria* shells were occupied by hermit crabs.

Dense deposits of dead shell were found on either side of Croixelles Harbour entrance. The shell was predominantly *Dosinia* and *Glycymeris* but also included *Ostrea*, *Pecten*, *Gari* and *Mactra* sp. as well as the gasteropods mentioned previously. Horse mussels *Atrina* also had a wide distribution over the Bay being taken in a damaged condition from time to time.

Oysters:

Oysters occur over most of Tasman Bay extending from the 5 to 23 fathom mark.

Location and Density:

See Map 9 - The density represents the number of marketable oysters taken in a single 5 minute drag. The area covered in a 5 minute drag would be about 586 square yards.

Map 7 shows the number of oysters over 2.1 in. in more detail.

The greatest concentration of marketable oysters was located in the centre of the Bay extending over an area of 8 square miles. It was in this area that the largest number of marketable oysters in one haul (34) were taken. In the same area occurred the greatest concentration of juvenile oysters, 63 being taken in 1 drag. These dense patches of oysters lie between the 5 to 15 fathom mark.

Juvenile Oysters:

These include all oysters under the marketable size of 2.1 in. in shell width. Map 8 shows the number of juvenile oysters taken during the survey. They are abundant only in one area, occupying approximately 11½ square miles of bottom with fairly distinct boundaries. At one place within the distance of 1 mile numbers drop from 63 a drag to 2 a drag. The distribution of juvenile oysters corresponds to the area of greatest concentration of mature oysters. From these facts it would appear that there is not a wide dispersion of oyster larvae in the breeding season. This will be discussed under the heading Distribution and Survival of Spatfall.

Structure of Oyster Beds:

Map 9 - Two main patches of over 15 oysters to a drag occur in the centre of the Bay over 7 square miles of bottom. To the west of these is a patch of oysters occupying 5 square miles with a density of from 10 to 15 oysters to a drag. Six patches with a density of from 5 to 10 oysters are scattered over the Bay occupying 15 square miles of bottom, while over the remainder of the oyster bearing ground (an area of 77 square miles) the oysters are sparse, less than 5 per shot being taken. It must be realized that although lines have been drawn delineating the various concentrations of oysters, these are only arbitrary as the number of oysters show a gradual increase or decrease from one zone to another.

Oysters are found over an area of approximately 100 square miles.

They are all of the same species <u>Ostrea sinuata</u> and are similar in shape and size range except for those in three small areas.

1. <u>Whangamoa Head</u>:

   A distinct oyster bed was located here in 10 fathoms of water. The oyster shell is clean and white with prominent ornamentation. Sizes range up to 4.8 in. in length but the shells have little depth to them.

2. Drags No. H 11 and 13 found a patch of oysters with a very deep thick, heavy shell, producing a particularly large and fat oyster.

3. Drags No. T 12 and 13 produced a medium shelled oyster similar to that taken from the rest of the Bay except for abundant short coral covering the surface of the shell.

<u>Length Frequency Diagram</u>: See Graph 2

This includes all live oysters taken in Tasman Bay during October 1961.

Two factors stand out:

1. The peak at 1.0 in. represents the result of a very good spatfall last season.
2. The bulk of the oysters of a marketable size fall between 2.5 to 3.5 in. in total shell length. The age of these is uncertain owing to the small numbers measured but would probably be from 3 to 5 years old.

Shell Shape:

Shell shape is influenced by surface of the bottom and depth of water.

The very large flat shells taken at Whangamoa could be due to these factors, i.e. a fairly firm flat surface on which to grow and somewhat shallower water than elsewhere.

The shape of the shell varied from a circular shell to those with a long narrow shoe-horn shaped shell. This latter shape is said to be due to the oyster living on a mud bed and extending the mantle in such a way as to confine the intake of water to the highest point above the bottom, where less muddy water would probably occur. It is a characteristic that in deeper and less muddy water the mantle is extended more uniformly around the shell and a broader shell result. Notice that oysters from Golden Bay, the bulk of which were in water of about 4 to 8 fathoms, were generally much lighter and thinner shelled than of those in Tasman Bay.

Shells generally possessed some ornamentation and varied from a light shell through a medium to a very heavy, compact, smooth shell. The thickness of the shell is probably mainly due to age of the oyster.

Shells were found easy to open although some of the lighter shells especially those from Whangamoa Head tended to flake and crack around shell edge when a knife was inserted.

Graph 3 shows the range of shell shapes.

Diagram 1 also shows the range of shell shape from circular to shoe-horn shaped.

Relation of Oysters to Other Fauna:

Scallops and mussel beds are found in the same area as the oyster bed. Map 11 shows their position in relation to one another. They all occur in the central southern portion of the Bay in water ranging from 5 to 15 fathoms.

The reasons for this concentration are not known. The bottom surface seems similar over the whole Bay. However, the distribution pattern may be related to the supply of food (all three shellfish being filter feeders) or to water movements affecting dispersal of larvae (all three shellfish having a free larvae stage).

Predators:

Three types of boring gasteropods were taken occasionally in the dredge. These were Poirieria, Alcithoe and Struthiolaria. Very few starfish were taken off the oyster bed. Specimens of Coscinasterias, the largest starfish observed, were obtained only very occasionally, not more than half a dozen being taken over the whole area. The effect of predators on the oyster beds are not known.

Spawning:

The spawning oyster in Tasman Bay is incubatory. The eggs are held in the mantle chamber and pass through stages of development in which the larvae develop a shell and other features. The shell colour changes over a period of a week or so from a white translucent to a purplish black colour, before being liberated into the water. When the larvae shells are white the spawning oyster is said to be whitesick and when black the oyster is termed blacksick.

Conditions causing *Ostrea sinuata* to spawn are a rise in temperature or a chemical stimulation or by a combination of these two.

A minimum temperature of about 59 to 60°F is necessary on the English oyster beds for successful spawning, (the European oyster also being incubatory). The American and Portuguese oyster requires a temperature of about 68°F while the Japanese oyster *Ostrea gigas* requires an even higher temperature of 77°F. These oysters, however, have no incubatory stage, spawning directly into the sea where fertilization and subsequent development occurs.

The oysters in Tasman Bay were found to be in white and blacksick condition with a water temperature ranging from 58° to 64°F.

In Golden Bay where blacksick oysters were also found the water temperature ranged from about 57° to 60°F. (These figures represent temperature of surface water only).

It is evident that this temperature range is satisfactory for spawning and it may be that *Ostrea sinuata* requires somewhat similar conditions as that of the European oyster *Ostrea edulis*.

A total of 222 oysters from Tasman Bay were examined. They ranged in size from 2.0 to 4.0 in. The results were as follows:

Immature	12	
Prespawning early	164	
Prespawning late	31	
Whitesick	6	6.7%
Blacksick	3	
Spent	6	
	222	

Thus 6.7% had either spawned or were in the process of doing so. Oysters under 2.0 in. were generally found to have little gonad development.

In the European oyster simultaneous spawning may occur in 15 to 20% of the population at any one time. Therefore it appears that the Tasman Bay oysters had not yet reached the peak of spawning at the time of the survey.

<u>Distribution and Survival of Spat</u>:

<u>Distribution</u>: See Map 8.

Juvenile oysters formed 47.68% by number of the total catch of oysters and were concentrated in an area of 11½ square miles with a very distinct boundary. The reasons for this apparent limited dispersal of larvae could be one or more of the following:

1. The larvae is restricted in its distribution.
2. Only a portion of the oysters spawned in the preceeding years.
3. The bottom over much of the area is for some reasons unsuitable for the survival of the spatfall.

Research in Foveaux Strait seems to show that the duration of the free-swimming larval stage is very short and this may account for the limited and concentrated spatfall. Then again, although the larvae possesses a ciliary circlet, it may depend to a greater extent upon the locomotory power of tidal currents for movement from place to place.

In southern Tasman Bay, there appears to be little water movement.

If the oysters are widely dispersed over an area, this will prevent satisfactory fertilization of the females and also may cause a lack of chemical stimulation between oysters of any one area, resulting in no simultaneous spawning taking place.

Scallop dredging has been carried out over much of the area outside the main oyster bed and this could result in disturbing the bottom, perhaps to the detriment of a successful spatfall.

<u>Survival of Spat</u>:

Survival and growth of the spat depends foremost on a satisfactory attachment surface. Where the bottom is mud such as in Tasman and Golden Bays, the presence of a pebble shell or other hard clean object is necessary to form a surface for attachment. If these oysters were worked commercially, thought could be given to the deposition of a suitable substance on the grounds prior to spatfall. In this way a much higher proportion of the spat would be saved for future growth and utilization.

The presence of a large mussel bed to the north end of the main oyster bed may also constitute a barrier to the spread of oysters in that direction and also influence the set of oysters in other areas. A heavy set of mussels on an oyster bed often smothers the oysters especially the juveniles. Mussels also accumulate a large amount of silt around themselves.

Larval development:

The blacksick larvae examined showed well developed shell, and ciliary circlet which provides limited locomotion for the free-swimming larvae.

Survival of Oysters Out of Water:

Oysters from Tasman Bay were left on deck under a damp sack and in the shade. They were examined periodically.

Total Number of Dead Oysters

Tuesday	
Friday	1
Saturday	5
Sunday	15
Monday	29
Tuesday	43
Wednesday	58

Total number of live oysters in experiment 61.

From this it appears that oysters can be kept up to three to four days in shell without a high mortality rate.

Four dozen oysters in shell were placed in a sack and put on ice. After 6 days only 8 had begun to gape, the remainder being tightly closed and in good condition.

Four dozen oysters were shelled and the meat placed in an open jar on ice. They were still fresh and edible after 9 days.

It appears that the oysters in shell can be safely kept in a cool place for at least 5 days and out of the shell, if partially frozen, up to and over 5 days.

Quality of Oysters:

Those oysters not spawning of spent were very fat, of a creamy white colour and of excellent quality. Crew hands on the "Ikatere" sampled them and declared them, in their opinion, to be of good flavour.

There was no sign of any green discolouration. Several had a brown staining around the mantle edge but this did not effect the flavour in any way.

Estimation of Abundance:

The area covered by the dredge was approximately 586 square yards per drag and one drag was made in each square mile. Thus to determine the number of oysters in one square mile, the factor for multiplication of the average number of oysters obtained in each shot is 5286.

This would give an estimated number of oysters per square mile. This final number would assume that the dredge was working 100% efficient. The accuracy of this estimated number, however, depends upon the efficiency of the dredge.

Shelbourne (1957) working on the British oysters estimated that his dredge was working with 30% efficiency.

Evidence seems to suggest that the type of dredge used on the Tasman Bay Survey was working with an efficiency of possibly only 10%.

Two sets of numbers have therefore been given in Table 1 showing estimated number of marketable oysters present. In each area the top number is a straight calculation assuming that the dredge was 100% efficient taking all oysters in its path. This number is useful as a basis for further calculations. The second underlined number is the estimated total number of marketable oysters present, assuming that the dredge was only 10% efficient.

Thus the total estimated number of oysters in Tasman Bay is 27½ million.

Note: Dredge was estimated 10% efficient on sand and shell bottom in Foveaux Strait; Tasman Bay is a mud bottom. This may effect correlation between the two areas.

The fact that oysters exist is not to say, however, that they are in sufficient quantity to support an industry. Obviously there must be a density of oysters below which it is no longer economic to fish.

Correlating the results of the scientific sampling dredge used down in Foveaux Strait with the commercial oyster dredges, has shown that the minimum number of marketable oysters in each 5 minute test sample shot must be above 15. Below this number the oysters are too thinly scattered to be worth fishing commercially by the Bluff Oyster boats. Thus although oysters exist over approximately 100 square miles of bottom in Tasman Bay, they are only concentrated economically in 8 square miles with an estimated population of 8 to 10 million. However, if the taking of scallops and mussels (when in season) was correlated with the taking of oysters it may be economic to work grounds with a density of only an average of 11 marketable oysters per 5 minute sample shot. This would open up another 6 square miles of bottom with an estimated population of 3½ million oysters.

The smaller size of the boats used, the proximity to port, the two man crews, and the good fishing weather in Tasman Bay may also help to make oyster fishing in this area still economic even though the catches were not as large as those from the Foveaux Strait oyster beds.

Discussion:

This oyster bed in Tasman Bay differs from that of Foveaux Strait in that the oysters occur on a mud bottom in Tasman Bay whereas in Foveaux Strait the oysters are found in a sand and shell bottom.

This factor must be considered in any correlation of results between the two areas.

The Tasman Bay oysters are also in an environment more subject to change than those of Foveaux Strait.

A mud bottom can be stirred up by dredging causing silt to lie in suspension. This may affect the oysters by clogging up the gills and palps. Dredging may also cause oysters to become buried in the mud.

The water in Tasman Bay is fairly stationary, thus any abnormal influx of fresh water, chemicals or minerals would take longer to disperse than in Foveaux Strait where there are strong tidal currents.

A green copper staining in the oysters has been reported to have occurred in the past. If this occurs as a diffuse colouration throughout the body but most marked in the blood channels, the oyster should not be eaten as it is diseased. This condition is due to an excess amount of copper being present in the water.

As Tasman Bay is surrounded by a highly mineralized belt with known deposits of copper, the colouration noticed in the past could be due to the above conditions. This colouration may perhaps be correlated with an abnormal amount of fresh water run-off into the Bay.

Oysters with only the gills dark green in colour and the body white are quite edible, the colour being due to an accumulation of long spindle shaped diatoms in the gills.

Another danger to the Tasman Bay oysters is the presence of a thick black algae which enters the Bay periodically. This settles on the bottom after a period and has been known to have killed oysters in the past.

As mentioned previously, the oysters are closely associated with mussels and scallops, these last two shellfish already being taken commercially. It would therefore seem to be more economic to allow the boats fishing for oysters to bring in the other two types of shellfish which may be taken incidentally to the main catch, than to scatter them back on the oyster beds.

In view of the soft mud bottom on which these oysters rest, consideration could be given to the deposition on the beds, of objects suitable for the attachment of the oyster larvae during the spawning season. The collection of oyster spat on artificially placed surfaces is common practise overseas, especially where oysters are cultivated under special conditions. The purpose of it is to retain the greatest possible number of oyster larvae, as those which settle on an unsuitable attachment surface are lost. The Tasman Bay oyster beds rest on a mud bottom so that there must be a very poor survival of larvae during the spawning season. It would therefore appear that the deposition of hard objects suitable as attachment surfaces would result in a much higher survival rate of the larvae.

The attachment surface must be clean, so that it would be necessary to deposit the shell or other suitable material just prior to the spawning season to prevent it becoming fouled by marine growth.

The types of shells available for redeposition are scallops, mussels and oyster (if opened locally). These shells could be scattered singly or perhaps better could be made into bundles, thus ensuring a more extensive surface well up from the sea floor and therefore less liable to sink into the mud or to be silted over. The best types of shell and the most suitable methods of using them would be determined over a period of time.

It appears that the beds in Tasman Bay in the vicinity of Nelson may be sufficient to support some fishing but that in other parts of the area oysters although widely distributed are rarely present in commercial quantities.

The 8 square miles of beds yielding more than 15 commercial oysters per experimental drag may be roughly compared to the 100 square miles of Foveaux Strait yielding similar catches although there is no evidence of the very dense patches which occur in Foveaux Strait.

Since Bluff lands approximately 100,000 sacks from a 100 square miles it is possible that sustained landings of 4-5000 sacks per annum could be obtained at Nelson.

It appears likely that a limited amount of exploitation of the Tasman Bay oysters could be permitted. However, any oyster fishing in this area would require careful and restrictive management with further research into survival of spatfall, fattening and growth of the developing oyster.

SUMMARY:

Tasman Bay, a sheltered body of water with mud bottom, provides suitable conditions for oyster survival and growth.

There is a somewhat uneven dispersion of oysters over the area.

The oysters are all similar in species and appearance apart from several local variations in shell shape.

Scallops and mussels are associated with the oysters and it would be difficult to fish only for oysters without taking quantities of the former two shellfish.

An estimated 27 million oysters are present. However, only 8 million oysters are in sufficient density to work economically.

These 8 million oysters occupy an area of 8 square miles.

It is possible that 4-5000 sacks could be removed annually from the oyster beds.

The normal predators found on oyster beds are present.

Spawning oysters were found with a surrounding water temperature of from 57° to 64°F.

These oysters are incubatory and at the time of the survey, October 1961, 6.7% were holding or had shed developing larvae.

Juvenile oysters had a limited dispersion, being concentrated in an area of 11½ square miles.

A good spatfall occurred last year.

The oysters survive for a minimum period of four days out of water.

It appears likely that a limited amount of exploitation of the Tasman Bay oyster beds could be permitted.

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TABLE 1 - Estimated numbers of Oysters in Tasman Bay assuming the dredge to be 100% and 10% efficient.

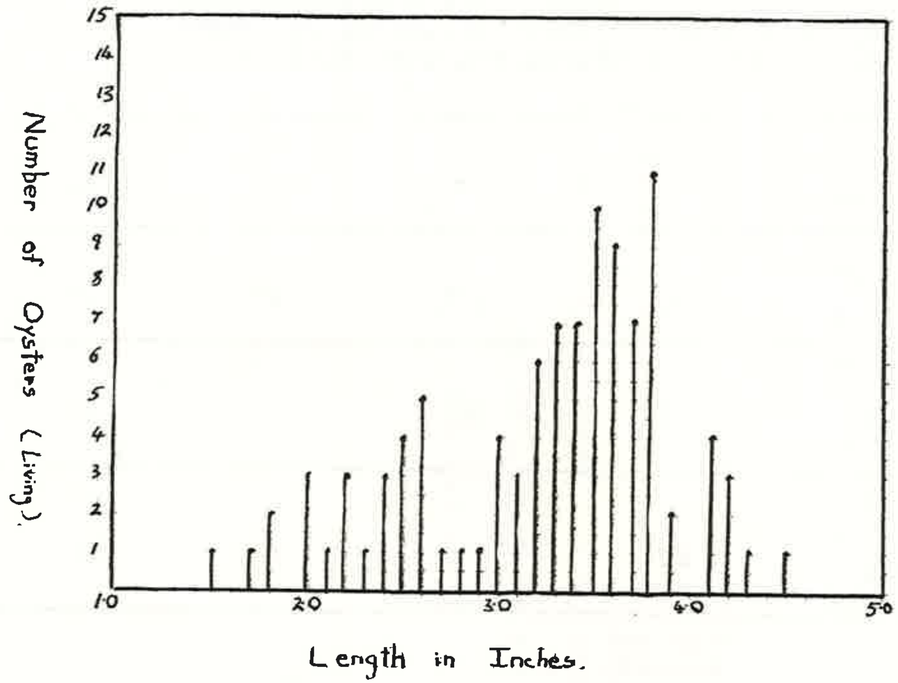
Area.	Density-Number per drag.	Total Area in Square Miles.	Number of Drags.	Number of Marketable Oysters.	Average Number of Marketable Oysters per Drag.	Efficiency of Dredge.	Number per Square Mile.	Total Number in Area.
1.	Over 15	8	8	151	19	If 100% then -	100,000	800,000
						If 10% then -	1 million	8 million
2.	10 - 15	6	9	99	11	If 100% then -	58,000	300,000
						If 10% -	580,000	3½ million
3.	5 - 10	15	15	112	7.5	If 100% -	40,000	600,000
						If 10% -	400,000	6 million
4.	Under 5	77	32	80	2.5	If 100% -	13,000	1 million
						If 10% -	130,000	10 million

Calculating that the dredge is only 10% efficient the total number of marketable oysters present in Tasman Bay is approximately - 27½ million.

Of this number, only 8 to 10 million are in a sufficient density to be worked economically.

Graph 1

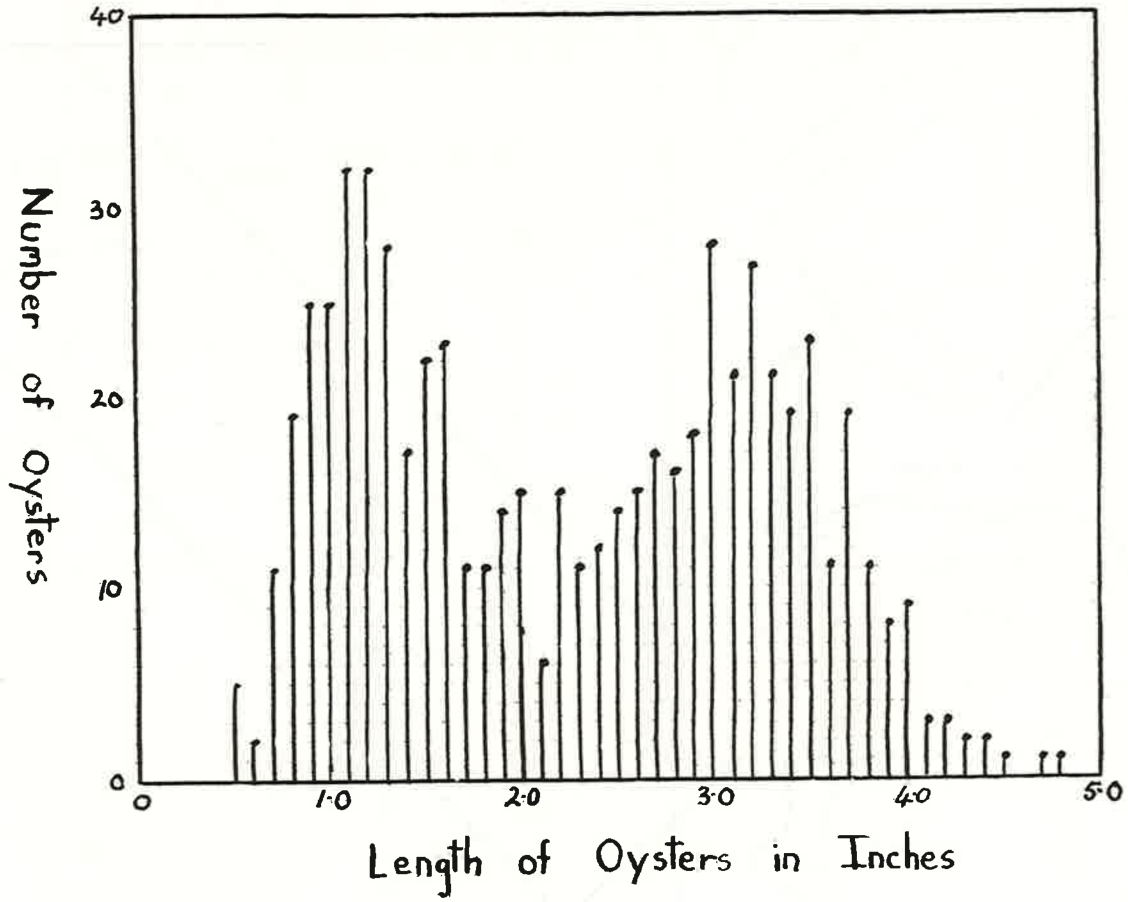
OYSTER BED GOLDEN BAY.



Length Frequency Diagram of Oysters From Oyster Bed. Golden Bay.

Graph 2 — OYSTER BED TASMAN BAY

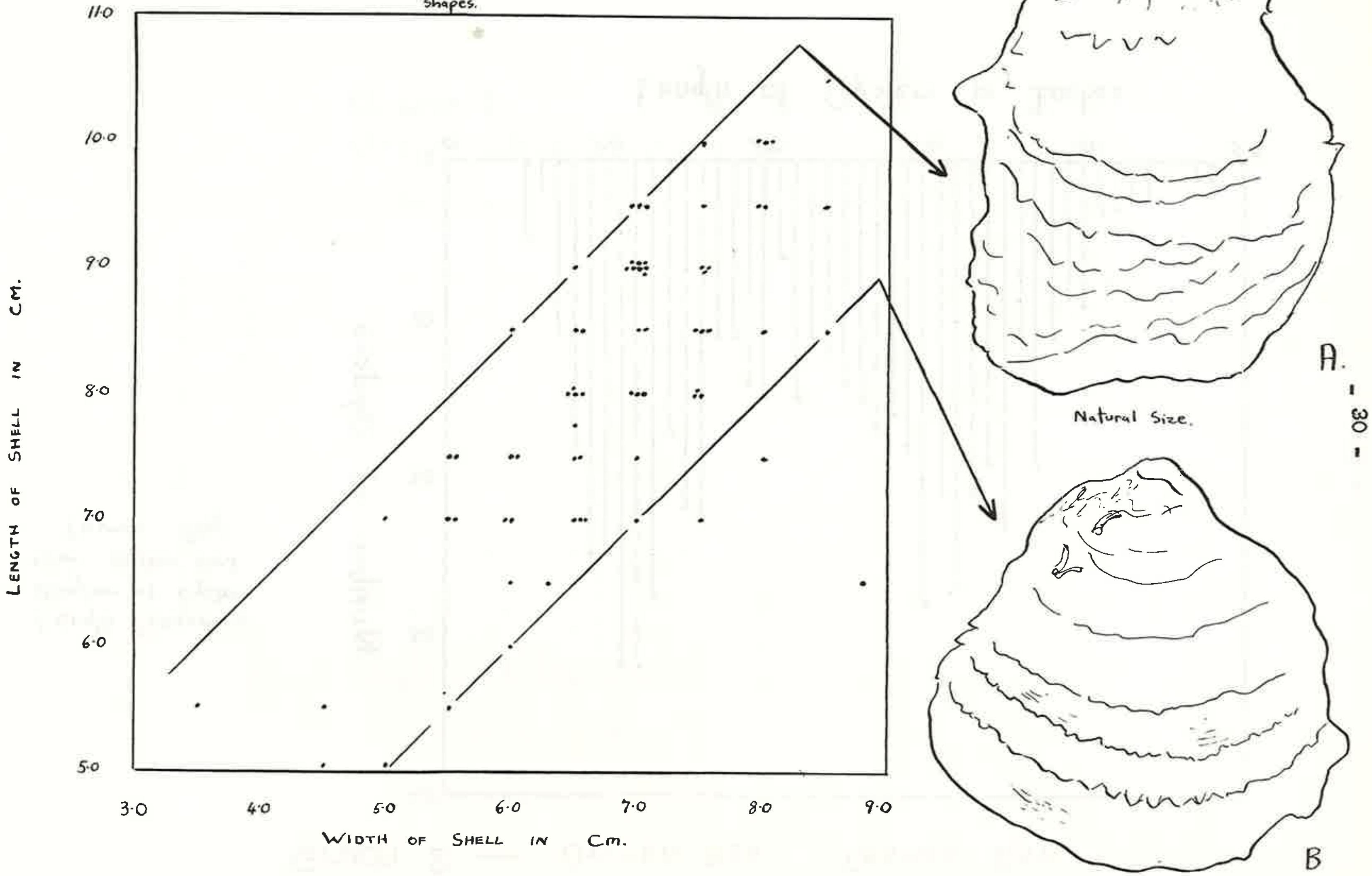
Length Frequency Diagram of Oysters From Oyster Bed Tasman Bay.



Graph 3 — GRAPH SHOWING VARIATIONS IN SHELL SHAPE

SHELLS A and B REPRESENT THE TWO EXTREMES

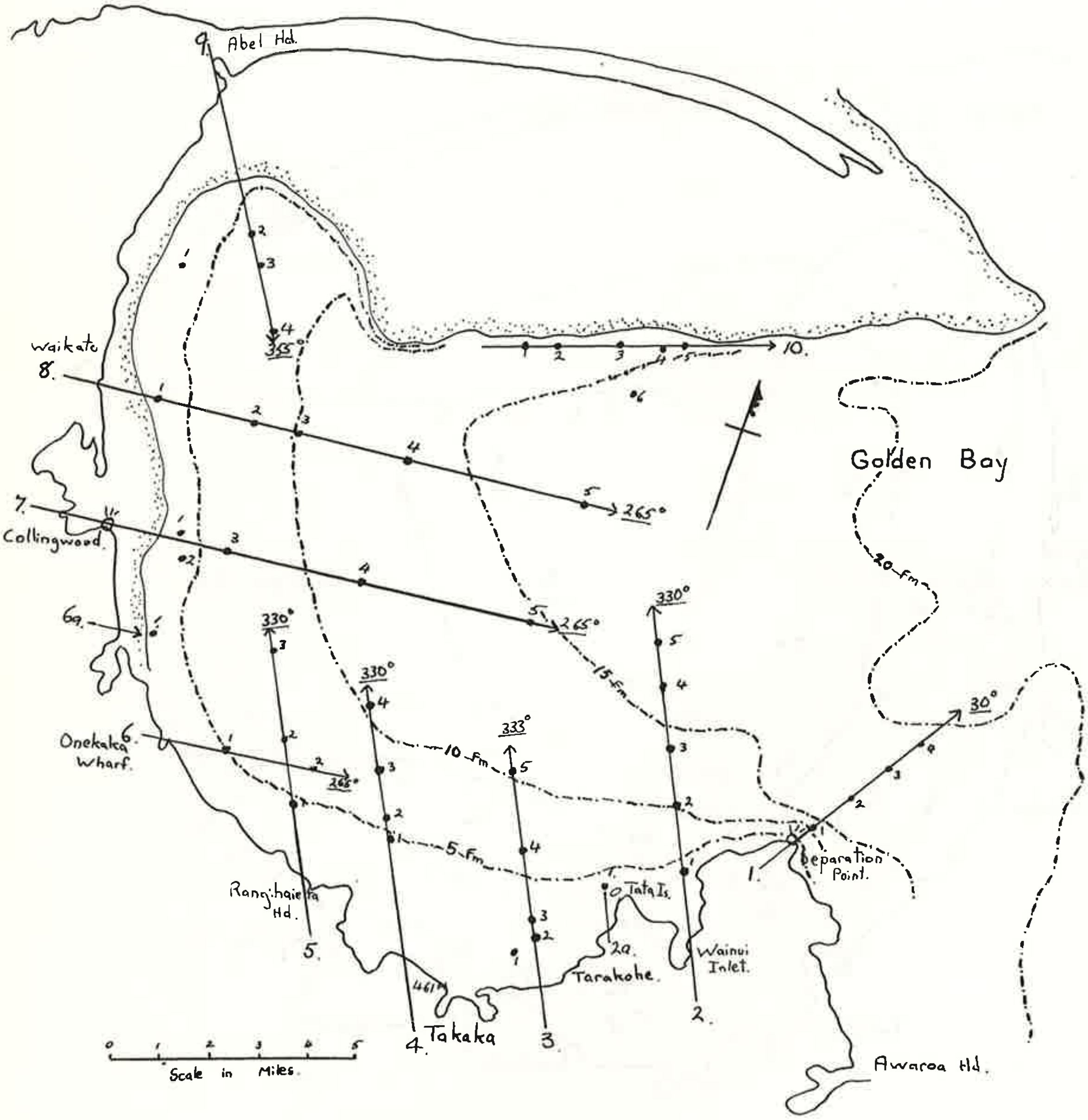
Note the majority of shells fall inbetween these two shapes.



Map 1

GOLDEN BAY

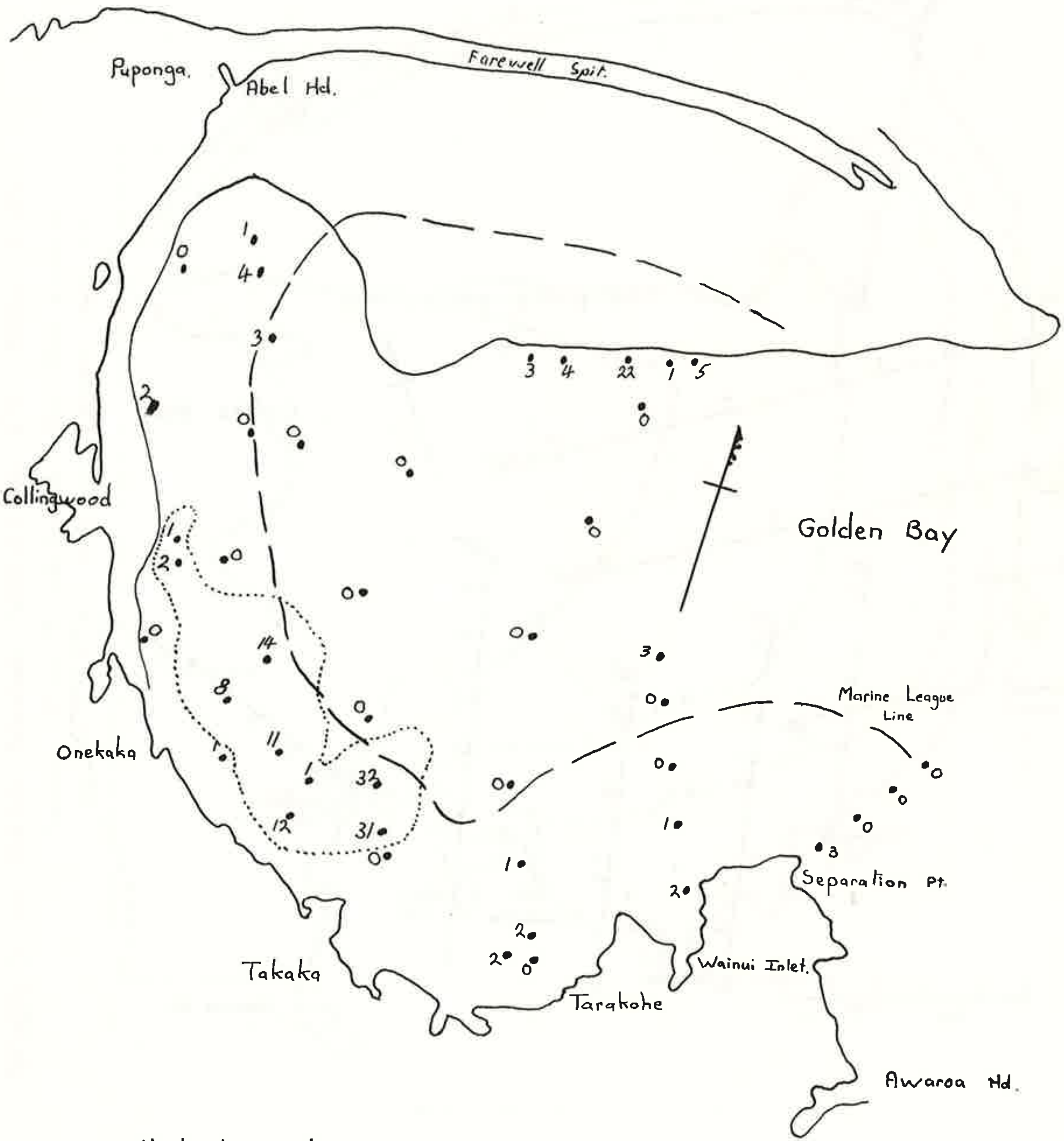
MAP SHOWING POSITION OF EACH DREDGE SHOT



Map 2

GOLDEN BAY

MAP SHOWING NUMBER OF OYSTERS IN EACH DRAG.



Dotted line shows approx. area of Oyster Bed.
Only live Oysters recorded.

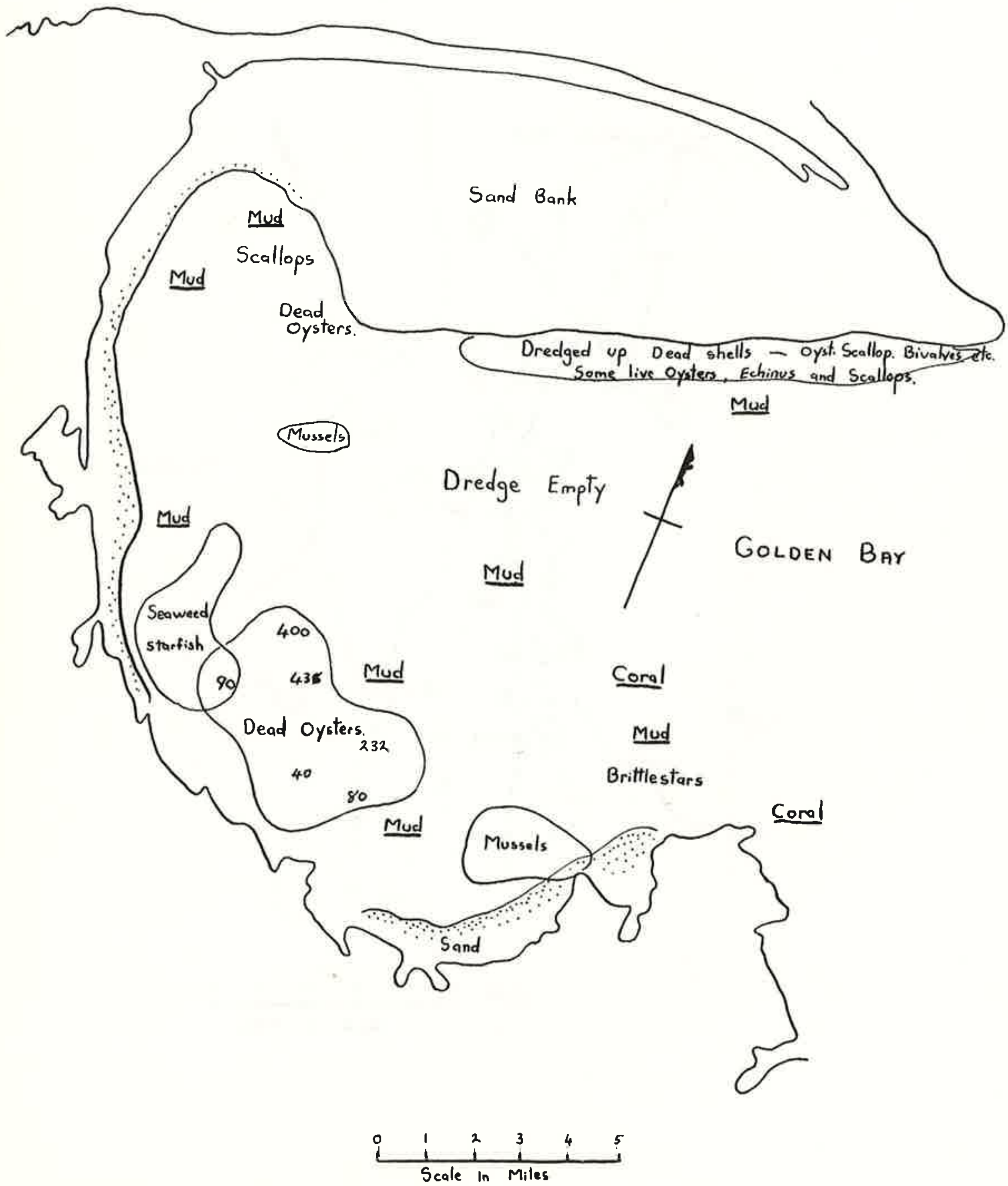
0 1 2 3 4 5
Scale in Miles.

Map 3

GOLDEN BAY

MAP SHOWING BOTTOM STRUCTURE AND

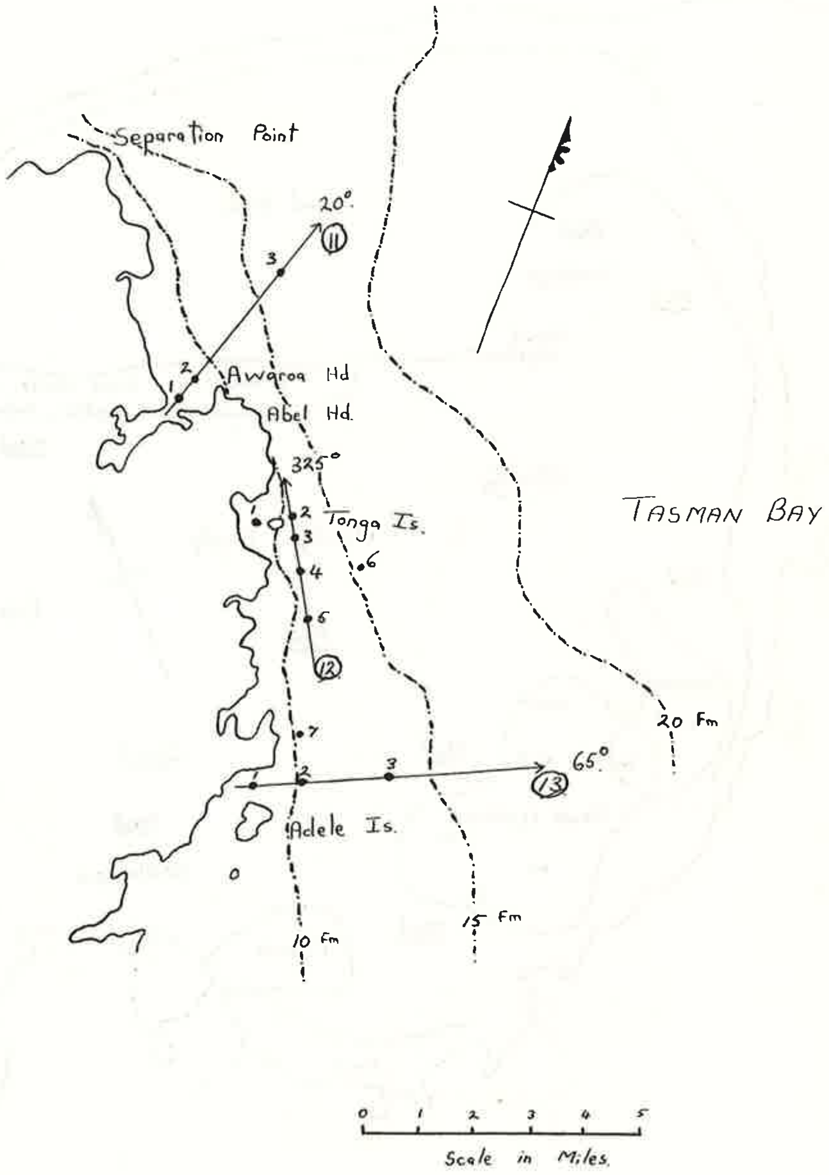
ASSOCIATED FAUNA



Map 4

Tonga Island

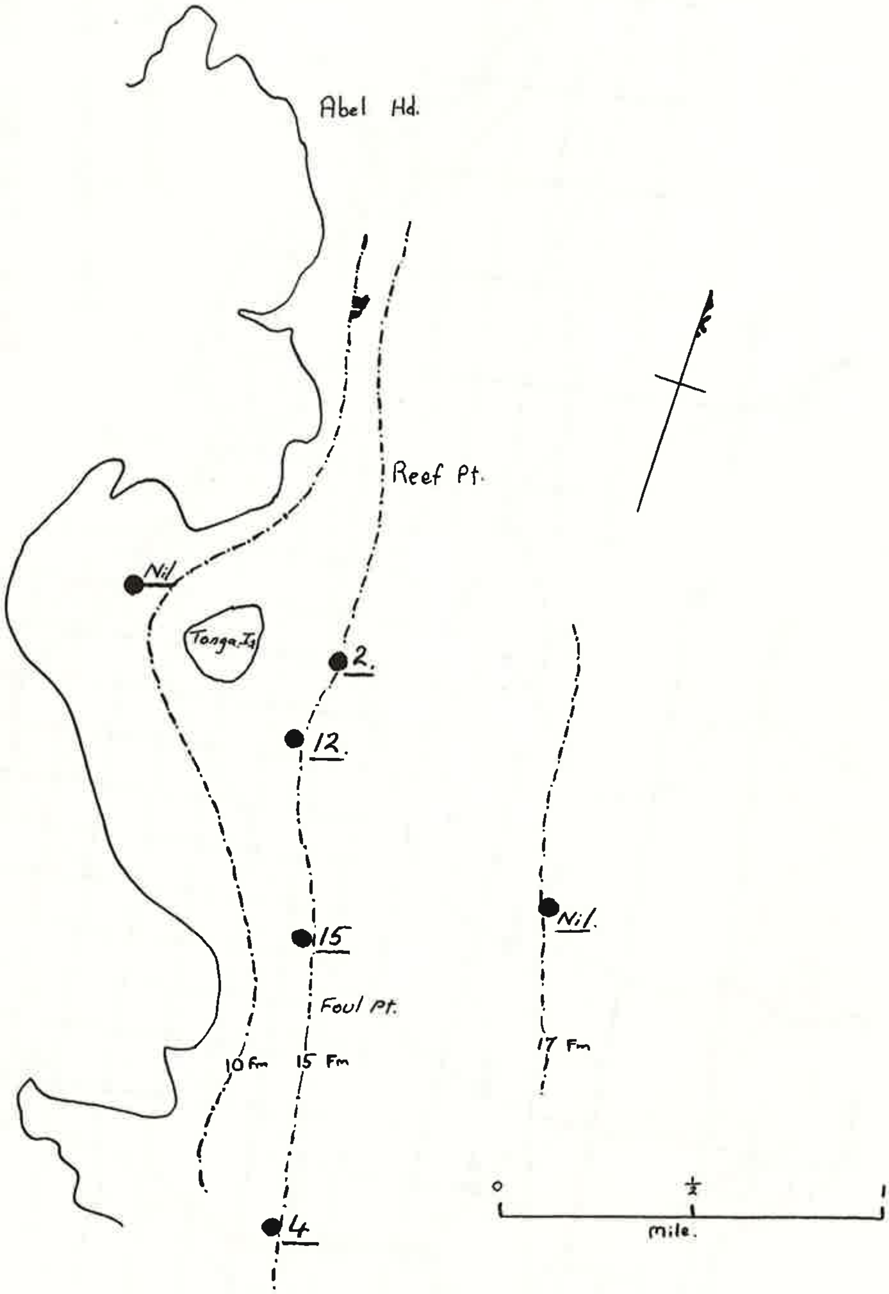
Map Showing Position of Each Dredge Shot

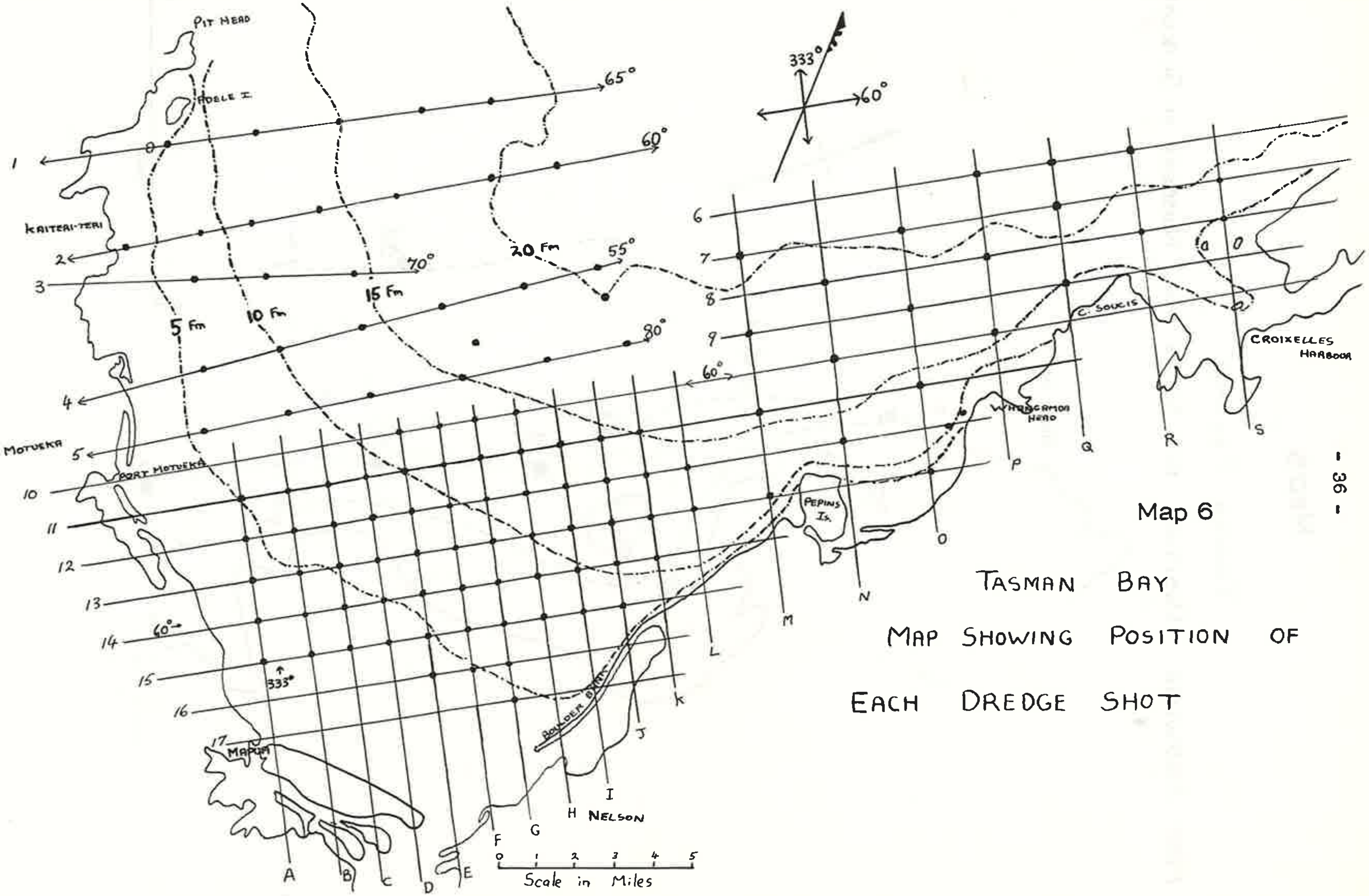


Map 5

TONGA ISLAND.

MAP SHOWING POSITION OF SHOTS AND NUMBERS OF SCALLOPS.

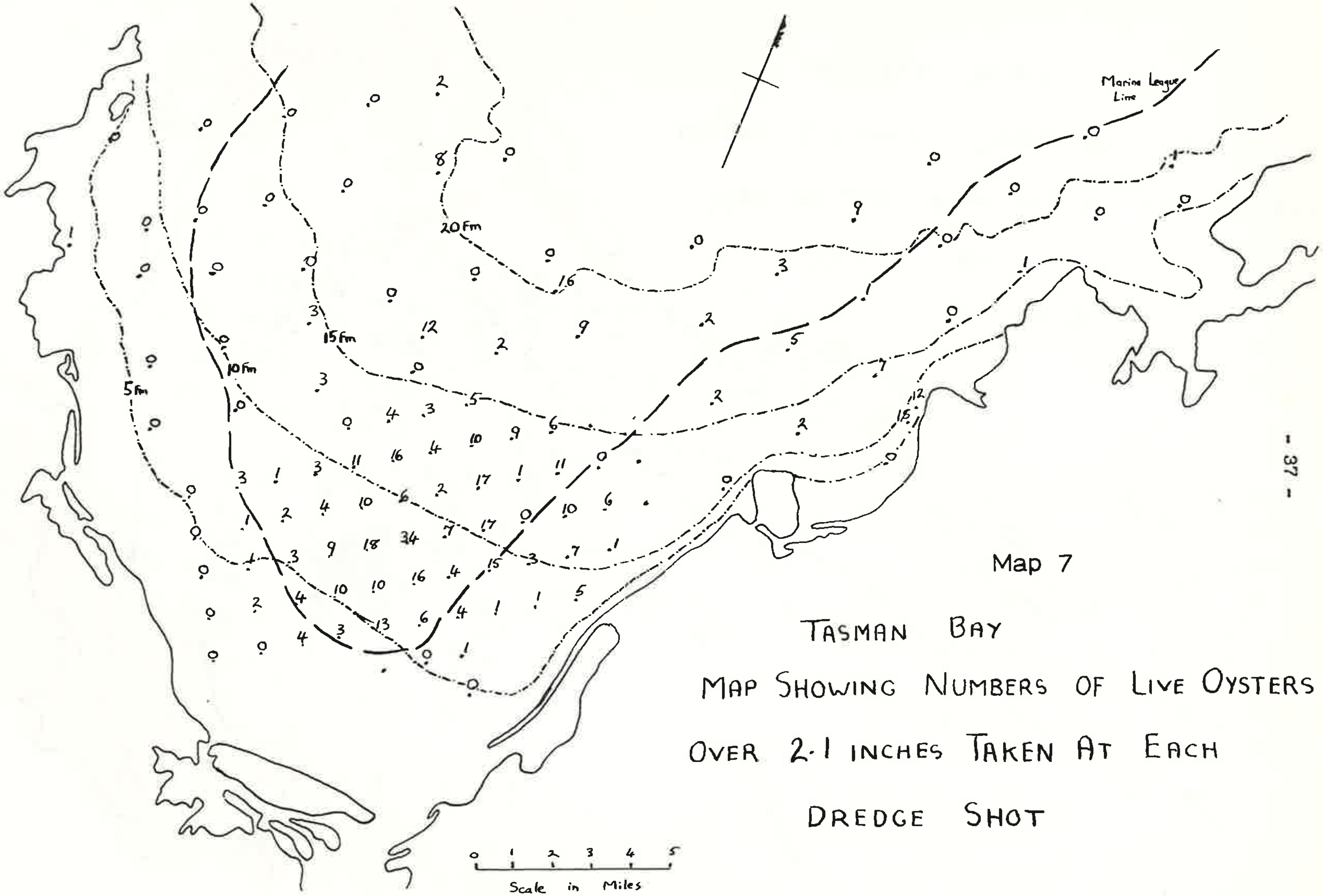




Map 6

TASMAN BAY

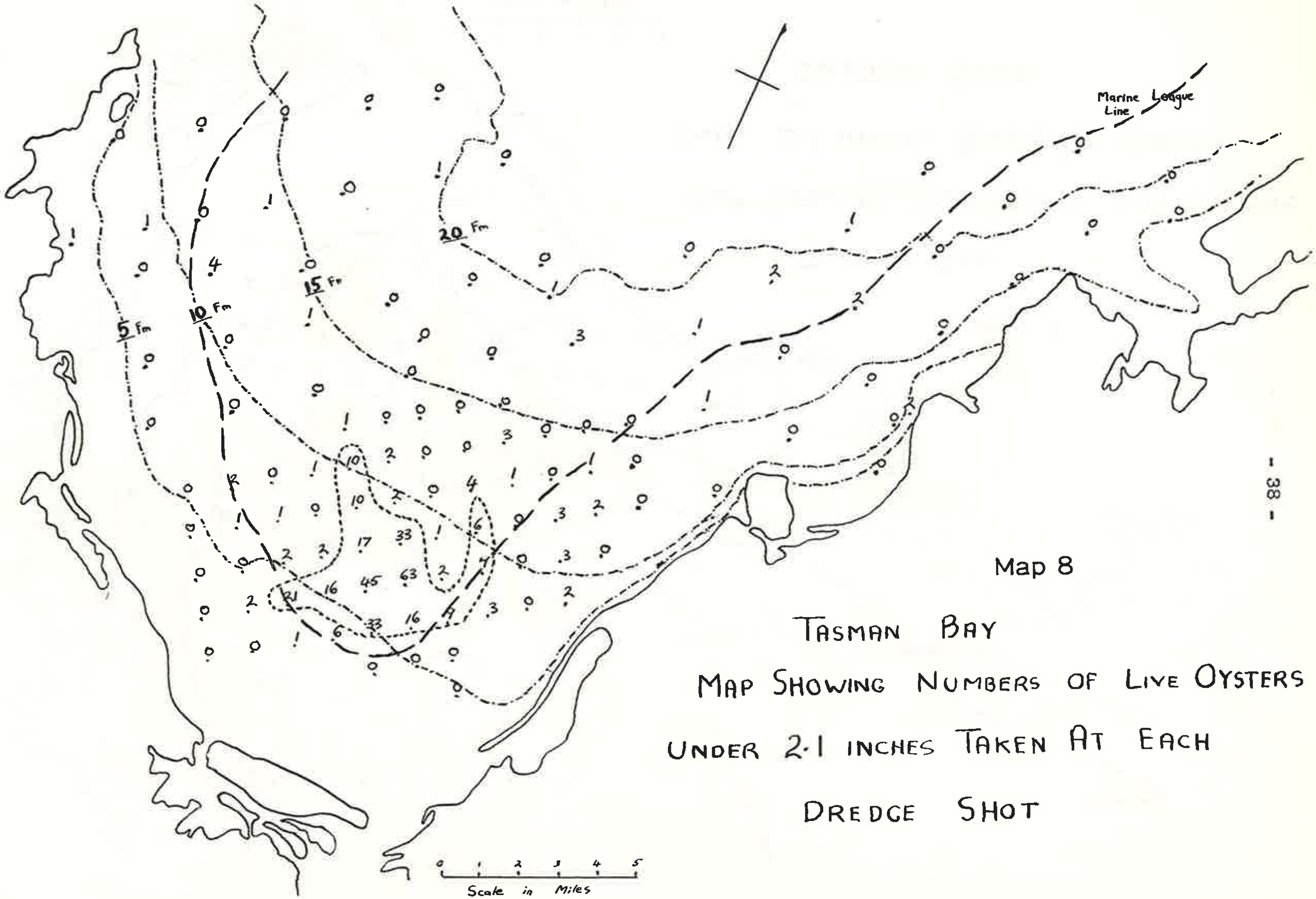
MAP SHOWING POSITION OF EACH DREDGE SHOT



Map 7

TASMAN BAY

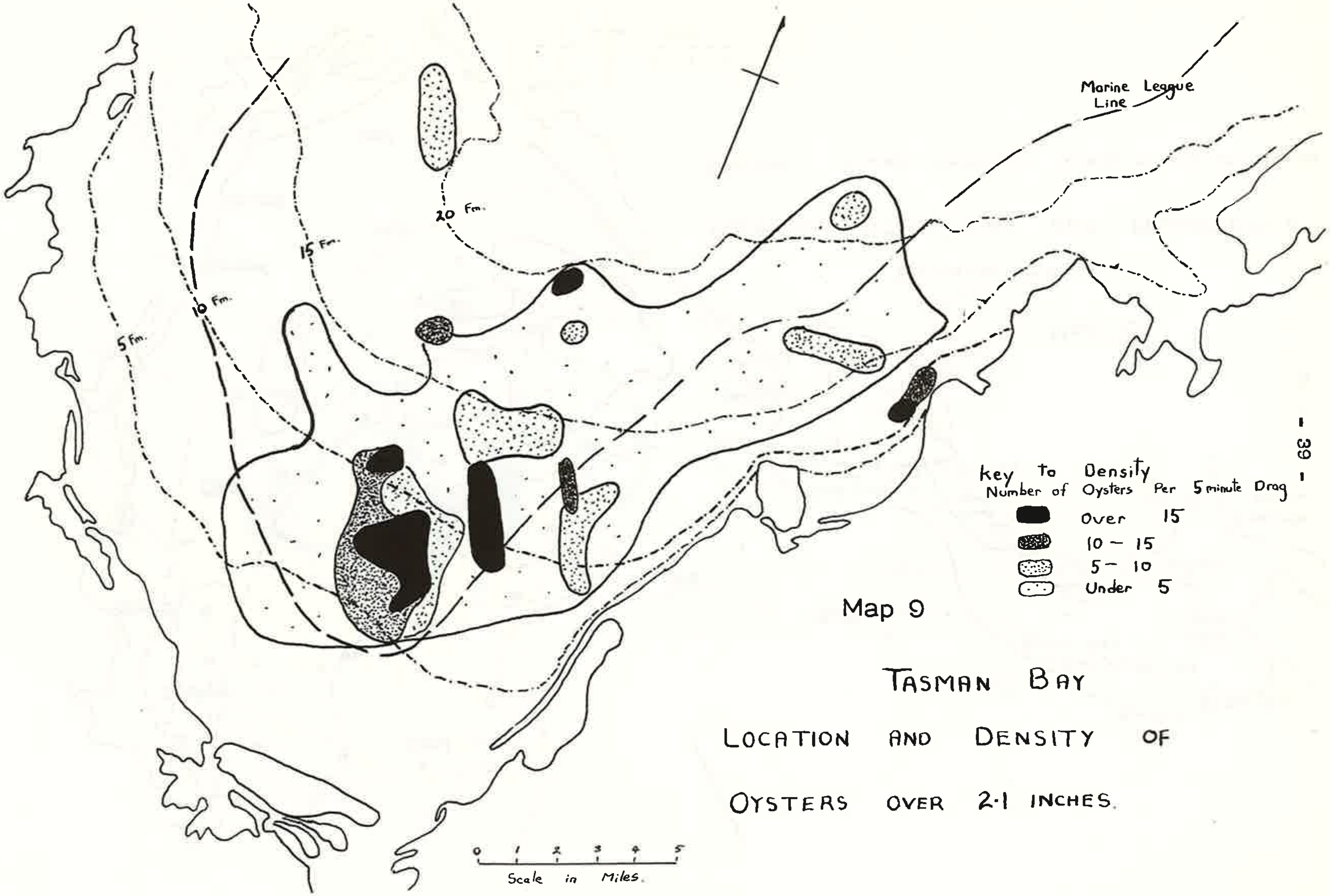
MAP SHOWING NUMBERS OF LIVE OYSTERS OVER 2·1 INCHES TAKEN AT EACH DREDGE SHOT



Map 8

TASMAN BAY

MAP SHOWING NUMBERS OF LIVE OYSTERS UNDER 2·1 INCHES TAKEN AT EACH DREDGE SHOT

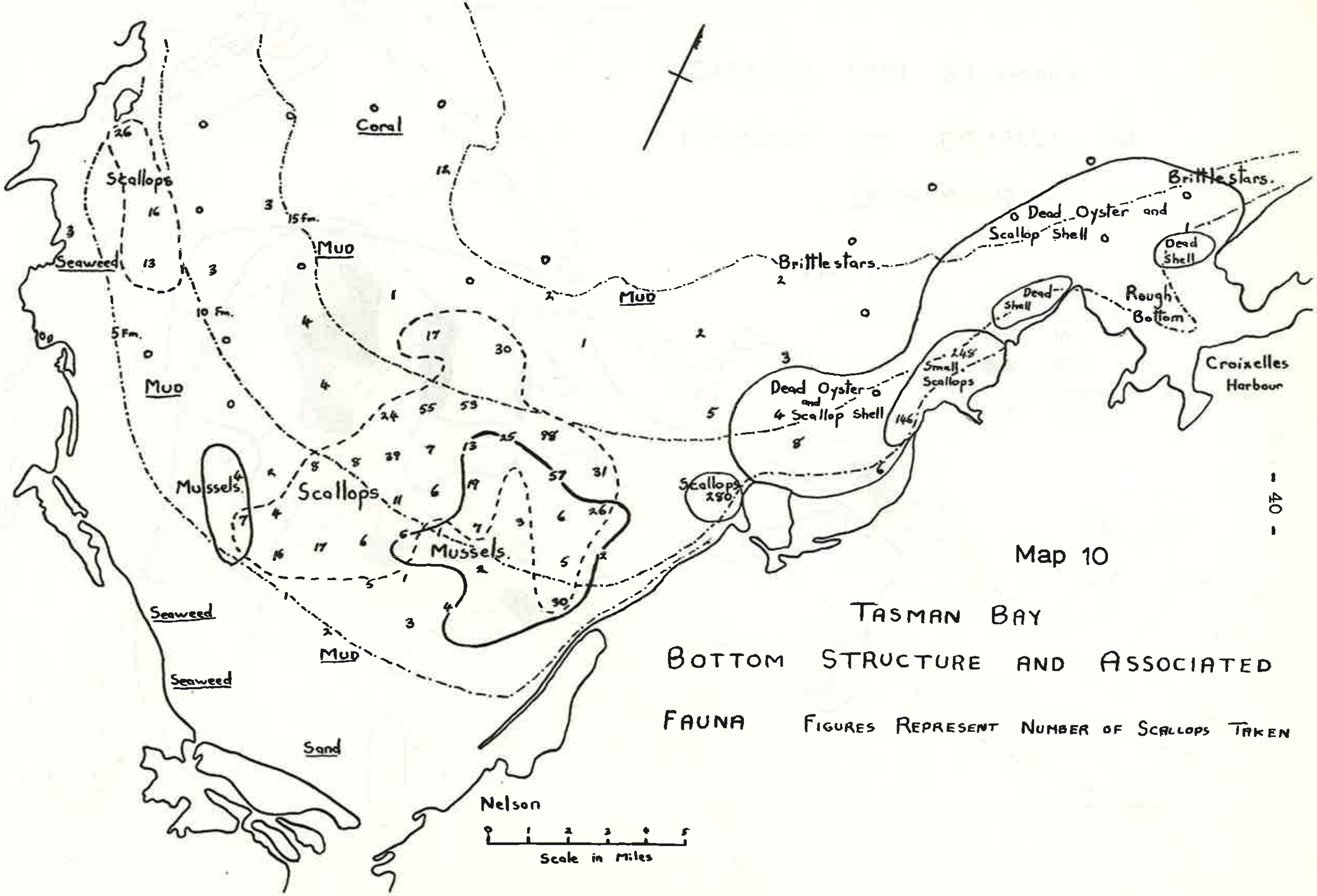


Map 9

TASMAN BAY

LOCATION AND DENSITY OF

OYSTERS OVER 2·1 INCHES.

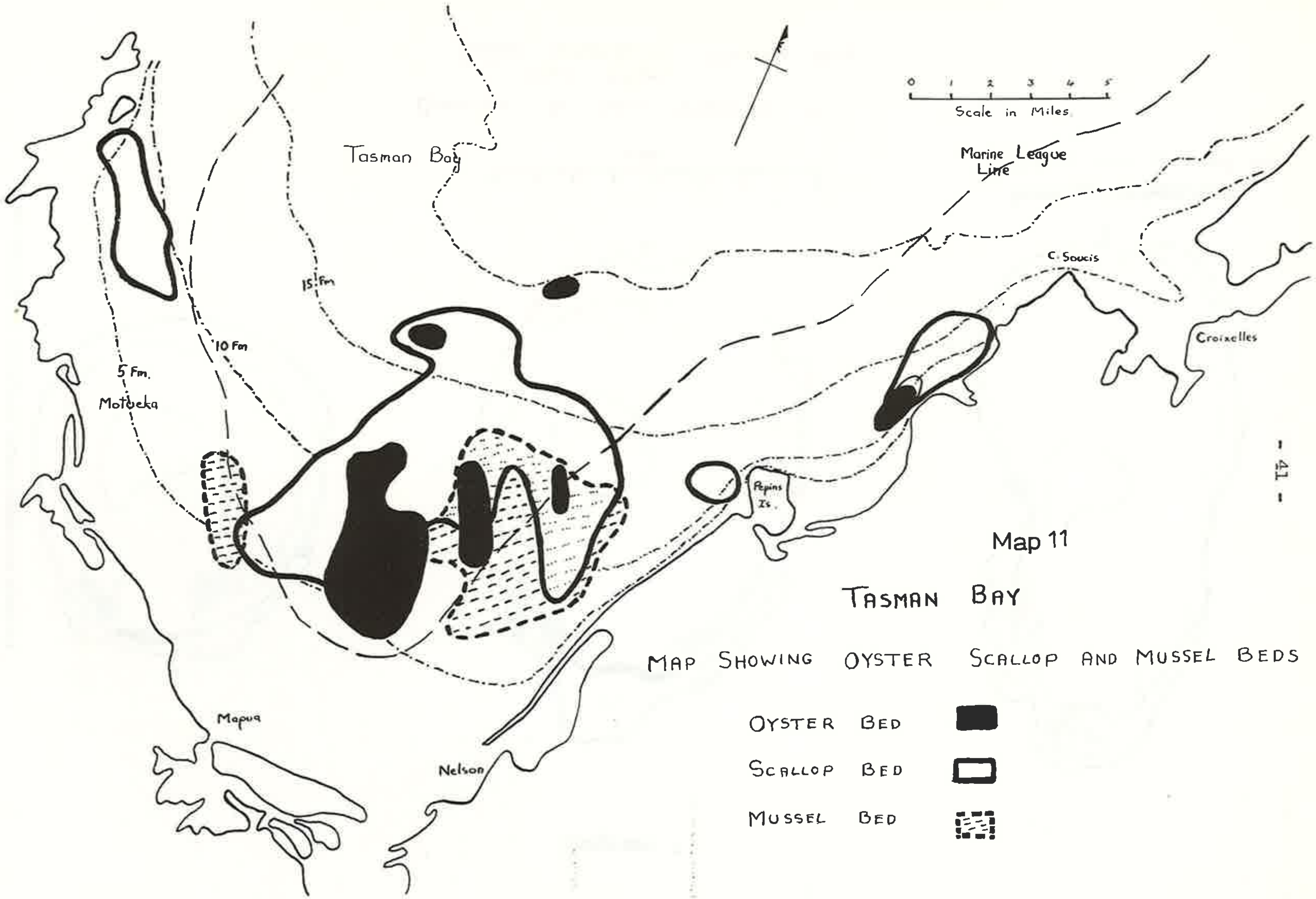


Map 10

TASMAN BAY

BOTTOM STRUCTURE AND ASSOCIATED FAUNA

FIGURES REPRESENT NUMBER OF SCALLOPS TAKEN

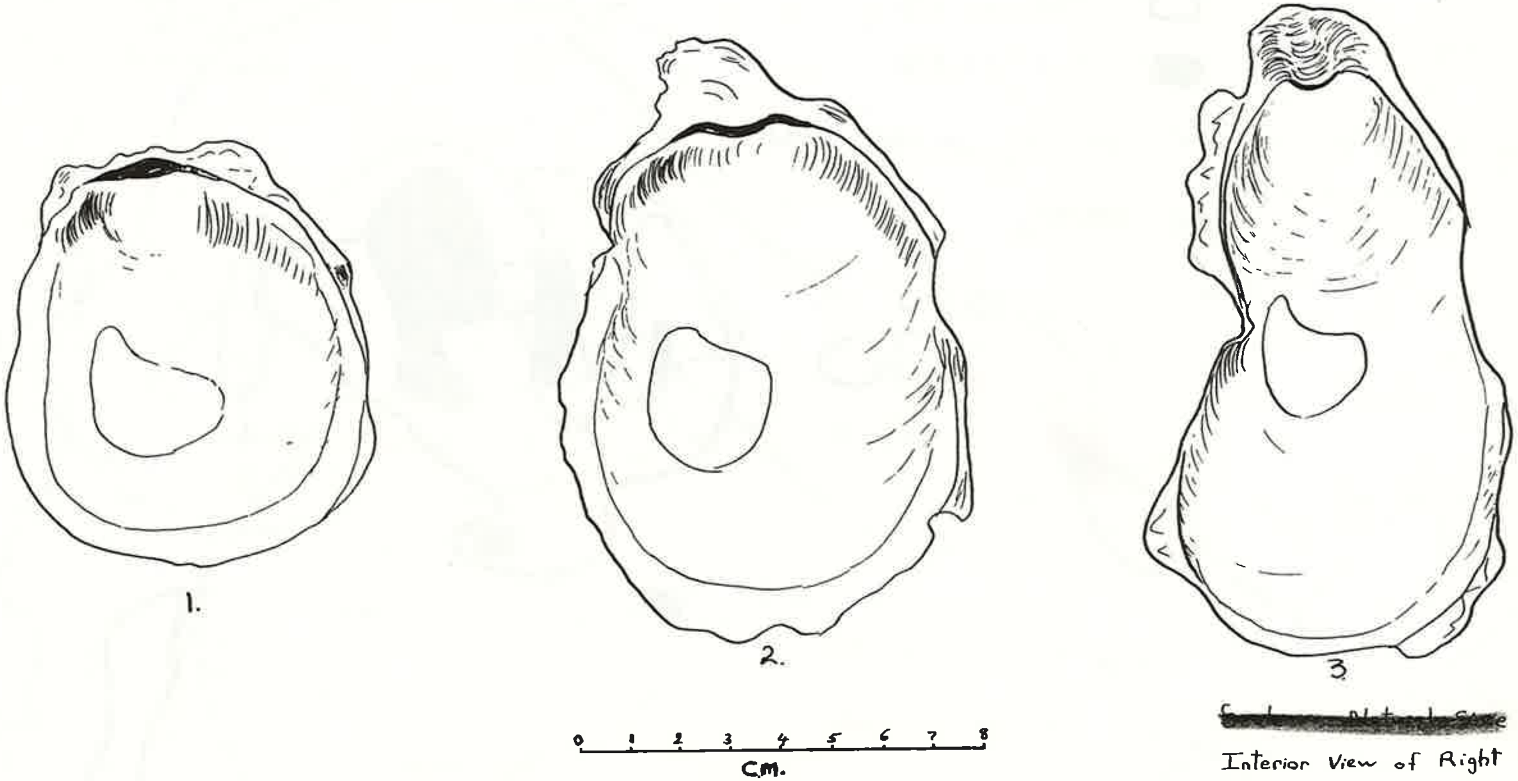


Map 11

TASMAN BAY

MAP SHOWING OYSTER SCALLOP AND MUSSEL BEDS

Diagram 1



Interior View of Right Valve.

Drawings to Show Variation in Shell Shape.
<u>Ostrea</u> <u>sinuata</u> — Tasman Bay.

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